Chemistry 255 Name(s):

Exercise 3: Hemoglobin

1. Some aquatic animals can remain underwater for up to an hour. It has been shown that they can remain underwater for so long because they are able to utilize nearly 100% of the O_2 in its blood. In contrast, humans can use only about 65% of the O_2 in their blood. It has been determined that their hemoglobin does not bind and is thus unaffected by BPG. HCO_3^-, however, has been shown to preferentially bind to the deoxyhemoglobin in these animals. Explain how the adaptation of HCO_3^- binding allows the prolonged underwater expeditions.

2. Hemoglobin can be dissociated into its four subunits and each subunits isolated. Isolated α subunits bind oxygen, but the O_2-saturation curve is hyperbolic instead of sigmoidal. In addition, the saturation curve is not affected by the presence of H^+, CO_2, or BPG. What do these observations indicate about the **cooperativity** and **allosterism** observed in hemoglobin?